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(71) Applicant: **AIR PRODUCTS AND CHEMICALS,
INC.
Allentown, PA 18195-1501 (US)**

(72) Inventors:

- **Senzaki, Yoshihide
Carlsbad, CA 92009 (US)**
- **Roberts, David Allen
Encinitas, CA 92024 (US)**
- **Norman, John Anthony Thomas
Encinitas, CA 92024 (US)**

(74) Representative: **Kador & Partner
Corneliusstrasse 15
80469 München (DE)**

(54) Liquid precursor mixtures for deposition of multicomponent metal containing materials

(57) The present invention is a composition for deposition of a mixed metal or metal compound layer, comprising a solventless mixture of at least two metal-ligand complex precursors, wherein the mixture is liquid at ambient conditions and the ligands are the same and are selected from the group consisting of alkyls, alkoxides, halides, hydrides, amides, imides, azides, nitrates, cyclopentadienyls, carbonyls, and their fluorine, oxygen and nitrogen substituted analogs; b) delivering the solventless mixture by direct liquid injection to a flash vaporization zone to vaporize the solventless mixture; c) contacting the substrate under deposition conditions with a resulting vapor of the solventless mixture, and c) depositing a multiple metal or metal compound layer on the substrate from the solventless mixture.

more metal-ligand complex precursors which constitute a liquid at ambient conditions, wherein the ligands are the same and are selected from the group consisting of alkyls, alkoxides, halides, hydrides, amides, imides, azides, nitrates, cyclopentadienyls, carbonyls, and their fluorine, oxygen and nitrogen substituted analogs; b) delivering the solventless mixture by direct liquid injection to a flash vaporization zone to vaporize the solventless mixture; c) contacting the substrate under deposition conditions with a resulting vapor of the solventless mixture, and c) depositing a multiple metal or metal compound layer on the substrate from the solventless mixture.



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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 4321

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US 3 632 429 A (MAEDA TEIZO ET AL) 4 January 1972 (1972-01-04) * column 3, line 42 - line 61 *	1,9,10, 12,13 ---	C23C16/40 C23C16/34
Y		2-6	
X	US 5 417 823 A (MARICQ MICHEL M ET AL) 23 May 1995 (1995-05-23)	1,10,11, 13,14	
Y	* column 2, line 31 - line 61; example 4 *	2,7,8 ---	
X	PATENT ABSTRACTS OF JAPAN vol. 009, no. 254 (C-308), 11 October 1985 (1985-10-11) & JP 60 108338 A (NIPPON DENSHIN DENWA KOSHA), 13 June 1985 (1985-06-13)	1	
A	* abstract *	10,14, 17,19 ---	
Y	US 5 464 666 A (FINE STEPHEN M ET AL) 7 November 1995 (1995-11-07)	2-8	
A	* examples 3,4 *	10,11,13 ---	
A,D	US 5 204 314 A (GARDINER ROBIN A ET AL) 20 April 1993 (1993-04-20) * column 9, line 26 - line 37 *	1-21	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	WO 99 28051 A (MINNESOTA MINING & MFG) 10 June 1999 (1999-06-10) * page 2, line 23 - page 3, line 20 * * page 10, line 24 - page 11, line 18 *	1-21	C23C B29F
A	US 5 262 199 A (DESU SESHU ET AL) 16 November 1993 (1993-11-16) * claims 20-24 *	19 ---	
		-/-	
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search		Examiner
THE HAGUE	16 November 2001		Ekhult, H
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 4321

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	<p>ATAGI L M ET AL: "HOMOLEPTIC TIN AND SILICON AMIDO COMPOUNDS AS PRECURSORS FOR LOW-TEMPERATURE ATMOSPHERIC PRESSURE CHEMICAL VAPOR DEPOSITION OF TIN AND SILICON OXIDE THIN FILMS" CHEMISTRY OF MATERIALS, AMERICAN CHEMICAL SOCIETY, WASHINGTON, US, vol. 6, no. 4, 1 April 1994 (1994-04-01), pages 360-361, XP000483694 ISSN: 0897-4756 * the whole document *</p> <p>-----</p>	15,16	
A	<p>DATABASE WPI Section Ch, Week 199921 Derwent Publications Ltd., London, GB; Class L03, AN 1999-250898 XP002183078 & JP 11 074478 A (MATSUSHITA ELECTRONICS CORP), 16 March 1999 (1999-03-16) * abstract *</p> <p>-----</p>	18,20	
A	<p>US 5 208 284 A (NIEBYLSKI LEONARD M) 4 May 1993 (1993-05-04) * column 1, line 40 - column 3, line 51 *</p> <p>-----</p>	21	<p>TECHNICAL FIELDS SEARCHED (Int.Cl.7)</p>
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	16 November 2001	Ekhult, H	
CATEGORY OF CITED DOCUMENTS		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>	
<p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>			

LACK OF UNITY OF INVENTION
SHEET BApplication Number
EP 00 11 4321

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-10,13

Processes and composition for deposition of a multiple metal or metal compound layer on a substrate of an electronic material, comprising using a solventless mixture of two or more metal-ligand complex precursors which constitute a liquid at ambient conditions, wherein said ligands are selected from the group consisting of alkyls, alkoxides, halides, hydrides, amides, imides, azides, nitrates, cyclopentadienyls, carbonyls, and their fluorine, oxygen and nitrogen substituted analogs.

2. Claims: 10,11

Solventless mixture of at least two metal-ligand complex precursors, wherein said mixture is liquid at ambient conditions and said ligands are selected from the group consisting of alkyls, alkoxides, halides, hydrides, amides, imides, azides, nitrates, cyclopentadienyls, carbonyls, and their fluorine and oxygen and nitrogen substituted analogs, and a first metal-ligand complex precursor which is liquid at ambient conditions and a second metal-ligand complex precursor which is liquid at ambient conditions.

3. Claims: 10,12

Solventless mixture of at least two metal-ligand complex precursors, wherein said mixture is liquid at ambient conditions and said ligands are selected from the group consisting of alkyls, alkoxides, halides, hydrides, amides, imides, azides, nitrates, cyclopentadienyls, carbonyls, and their fluorine and oxygen and nitrogen substituted analogs, and a first metal-ligand complex precursor which is liquid at ambient conditions and a second metal-ligand complex precursor which is solid at ambient conditions and miscible in the first metal-ligand complex precursor.

4. Claims: 10,14(partly)-16,18,20,21

A solventless mixture of at least two metal-ligand complex precursors said mixture is liquid at ambient conditions, the ligand being selected from the group dimethyl amido, diethyl amido, ethylmethyl amido, butyl amido, dipropyl amido, methylpropyl amido, ethylpropyl amido.

5. Claims: 10,14(partly),17,19



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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 00 11 4321

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

A solventless mixture of at least two metal-ligand complex precursors said mixture is liquid at ambient conditions, the ligand being selected from the group methoxy, ethoxy, propoxy, and butoxy.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 11 4321

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-11-2001